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**Occurrence of *Listeria* Species in Fresh Poultry in Gaza Strip.****Abstract**

*Listeria monocytogenes* has gained worldwide interest because it causes food borne illnesses. Present study was performed on three hundred and seventy five samples of fresh poultry (turkey & chicken) collected from different poultry meat sales centers, in Gaza Strip. Results showed that *Listeria* species could be isolated from both internal and external parts of poultry samples with an incidence rate of 14.1%. Five *Listeria* species were isolated and identified by Listeria API system (*L. monocytogenes*, *L. ivanovii*, *L. grayii*, *L. innocua* and *L. welshimeri*). Isolation of these species was higher in external parts than internal parts of poultry suggesting contamination from external sources. These findings suggest the need for implementing more strict measures to reduce contamination during processing, handling and storage.

**Key words:** Poultry meat, Listeriosis, *L. monocytogenes*, Gaza

**Introduction**

Eight species are at present included in the genus *Listeria*: *L. monocytogenes*, *L. innocua*, *L. ivanovii*, *L. grayi*, *L. welshimeri*, *L. seeligeri*, *L. murrayi* and *L. denitrificans* (1). *Listeria monocytogenes* is associated with a variety of environments including soils, water, sewage, silage, as well as plant and animal food products (2) vegetables, and intestinal contents of a variety of birds, fish, insects and other animals (3). Among all species in the genus *Listeria*, only *L. monocytogenes* has been implicated in human foodborne illness (4 , 5). *L. monocytogenes* is a pathogen of humans and animals which has been implicated in several outbreaks and sporadic cases of listeriosis, resulting in numerous food product recalls (6). Although reported cases of human

foodborne listeriosis are rare, the incidence of serious illnesses and death in affected individuals is high (7). The level of exposure necessary for infection is unknown and probably varies from person to person, although patients with immunity disorders, pregnant women, newborn babies, alcoholics, diabetics, elderly people and drug addicts do have a higher risk of infection (3).

The frequency of human infections varies from country to country and can occur individually or as an epidemic. Over last few decades, the worldwide rate of human listeriosis has gradually increased. Up until the 1960's about 1,000 cases of the disease had been recorded, and by 1976 this had risen to around 5,000 cases (8). Foreign literature has numerous reports about the contamination of foodstuff with *L.*

*monocytogenes* (9, 10) and the resulting human infections (11, 12). This research aims at determining the level of *L. monocytogenes* and other *Listeria* species contamination in fresh poultry products which are one of the most risky foodstuffs, as this has never been investigated in Gaza Strip.

## Materials and Methods

A total of 375 fresh poultry samples (168 turkey and 207 chicken samples) were collected from different poultry meat retail shops in Gaza Strip and examined for the presence of *Listeria* species. The turkey samples comprised 45 internal (Liver, heart, stomach) and 123 external (breast, legs, wings and backs) and the chicken samples included 47 internal and 160 external. Samples were collected, preserved and transported according to (1). About 100 grams samples were collected in a sterile plastic cups and placed in ice box and transported to the Public Health Laboratory (Ministry of Health, Palestine). Sampling was conducted over a period of eight months from June 2003 to February 2004.

Twenty five gram of each sample was homogenized with 225 ml of *Listeria* Enrichment Broth (13) with antibiotics (10 mg Nalidixic acid and 6 mg Acriflavine) and incubated at 30 °C for 48 hours. Subcultures from the incubated *Listeria* enrichment broth were made onto the surface of blood agar and *Listeria* agar with antibiotics (200 mg Cyclohexamide, 10 mg Colistine sulfate, 5 mg Fosfomycine, 1 mg Cefotetan and 2.5 mg Acriflavine). Plates are incubated at 30 °C for 48 hours 5% CO<sub>2</sub> atmosphere (1). Growth was examined and colonies were checked for their size, color,

consistency and shape. Cultures on blood agar were also examined for colony size and type of hemolysis. Beta hemolysis, gram staining, catalase test and *Listeria* API tests were used to identify suspected isolates (1).

## Results

A total of 375 poultry meat samples collected from the different poultry sales centers and shops from Gaza Strip governorates were investigated for *Listeria* species. 115 samples were collected from Khan Younis, 85 from Mid zone, 78 from north, 49 from Gaza, and 48 from rafah Governorate.

Results given in **table 1** revealed that *Listeria* was isolated from 14.1 % (53 out of 375 samples) of poultry meat (turkey & chicken). *Listeria* species were isolated with a higher frequency in external than internal organ and that both *Listeria monocytogenes* and *L. welshimerii* were only isolated from external samples.

The incidence of *Listeria* isolation and distribution from poultry sample is summarized in **table 2**. Turkey external organ showed the highest level of contamination (23.6%), while internal chicken samples showed the least contamination levels (4.3%). Only 5 species of *Listeria* were isolated from the tested samples. *Listeria innocua* was isolated from 14 samples while *L. grayii* was isolated from 13 samples, followed by *L. ivanoyii* and *L. monocytogenes*. *L. welshimerii* was isolated only from 3 samples. *L. monocytogenes* was isolated from external parts of both turkey and chicken meat but not from internal organs suggesting environmental contamination.

**Table (1):** Distribution of *Listeria* spp. positive samples

Sample Type	Total of samples		Positive samples	
	NO.	(%)	NO.	(%)
Turkey internal	45	12	4	(8.9%)
Turkey external	123	32.8	29	(23.6%)
Chicken internal	47	12.5	2	(4.3%)
Chicken external	160	42.7	18	(11.3%)
<b>Total</b>	<b>375</b>	<b>100</b>	<b>53</b>	<b>(14.1%)</b>

According to the data presented in **table (3)**, the Mid Zone area showed the highest prevalence rate of *Listeria* species followed by Khan Younis.

Gaza and the North governorate showed the least number of *Listeria* isolates.

**Table (2):** *Listeria* species isolated from the both Turkey and Chicken samples

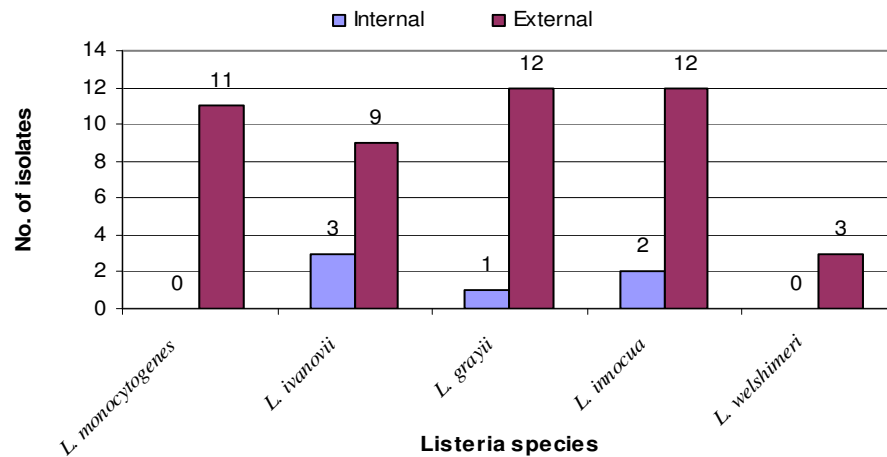
Species	Turkey Samples		Chicken samples		Total (Turkey and chicken)		Total
	Internal	External	Internal	External	Internal	External	
<i>L. monocytogenes</i>	0	7	0	4	0	11	11
<i>L. ivanovii</i>	1	2	2	7	3	9	12
<i>L. grayii</i>	1	7	0	5	1	12	13
<i>L. innocua</i>	2	11	0	1	2	12	14
<i>L. welshimeri</i>	0	2	0	1	0	3	3
Total	4	29	2	18	6	47	53

**Table (3):** Distribution of *Listeria* species isolates over the governorate of Gaza strip

Species	North	Gaza	Mid zone	Khan Younis	Rafah	Total	%
<i>L. monocytogenes</i>	0	4	7	0	0	11	2.9
<i>L. ivanovii</i>	4	0	3	5	0	12	3.2
<i>L. grayii</i>	1	0	3	4	5	13	3.5
<i>L. innocua</i>	0	0	11	0	3	14	3.7
<i>L. welshimeri</i>	1	0	0	2	0	3	0.8
<b>Total</b>	<b>6</b>	<b>4</b>	<b>24</b>	<b>11</b>	<b>8</b>	<b>53</b>	<b>14.1</b>

From **figure (1)** it is evident that all other *Listeria* species were isolated with a frequency higher in external than internal organs and that both *L.*

*monocytogenes* and *L. welshimeri* were only isolated from external samples.

**Figure (1):** Comparison between external and internal samples load of *Listeria* species.

## Discussion

A prominent pathogen is *Listeria monocytogenes*, as this Gram-positive facultative anaerobic has caused numerous outbreaks and sporadic cases of listeriosis, mostly in North America and Europe (7, 14, 15). This bacterium is widely distributed in food products (21) and is able to proliferate at refrigeration temperatures (15).

This survey of raw chicken and turkey from slaughter houses and shops in Gaza Strip proved that *Listeria* species were present in 14.1% of the examined samples. *Listeria monocytogenes* was present only in 2.9% of the sample. This finding is different from other similar investigations. Kwiatek, (16) reported 60% isolation of *Listeria*. In a study by Capita *et al.*, (17), 95% of the samples contained *Listeria* species among which they recognized 32% as *Listeria monocytogenes* and 66% as *Listeria innocua*. The survey of chicken carcasses and poultry raw meat from shops in Finland proved that *L. monocytogenes* was present in 62% of the samples (18).

Variation among similar studies may be a direct result of the ability of *L. monocytogenes* to grow in a wide temperature range, from -1.5 to 45°C (19, 20). Poor sanitary conditions during handling and processing may also contribute to higher incidence of contamination. Another possible factor that should be investigated is the source of poultry. Differences between sampling and isolation methods should also be considered in the context of differences between results (21).

The higher incidence of *Listeria* in external than internal parts suggests contaminations of carcasses during handling and processing. The sources of contamination vary but may be from

poultry feces as *L. monocytogenes* has been isolated from the fecal samples of chickens (22, 23) in many countries. In a study by Kalender, (21) he concluded that animal feces can represent a source of *L. monocytogenes* contamination of carcasses at abattoirs. This constitutes a serious hazard to human health as it may lead to outbreaks of human listeriosis.

The unusual growth and survival properties of *L. monocytogenes* (24) and its ability to adhere to various food contact surfaces (25) each contribute to the complexity of eliminating the organism from this environment. Therefore, to reduce or eliminate the potential for cross contamination of foods from the processing environment, attention must be focused on detection contamination sources and practices.

Several studies have demonstrated that for poultry processing, the processing environment is a major source of *Listeria* contamination of raw and cooked poultry products (26, 27). In each of these studies, the incidence of *Listeria* spp. and *L. monocytogenes* within the product increased from the beginning to the end of processing, indicating the occurrence of cross-contamination from the environment.

Taking the result of this study into consideration, poultry processing (including storage and display) in Gaza, seems to be in need for improvement of sanitary conditions and control measures to minimize risks arising from *Listeria* contamination. Further research is required to study specific endemic strains. Epidemiological tracking of such strains is also required.

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